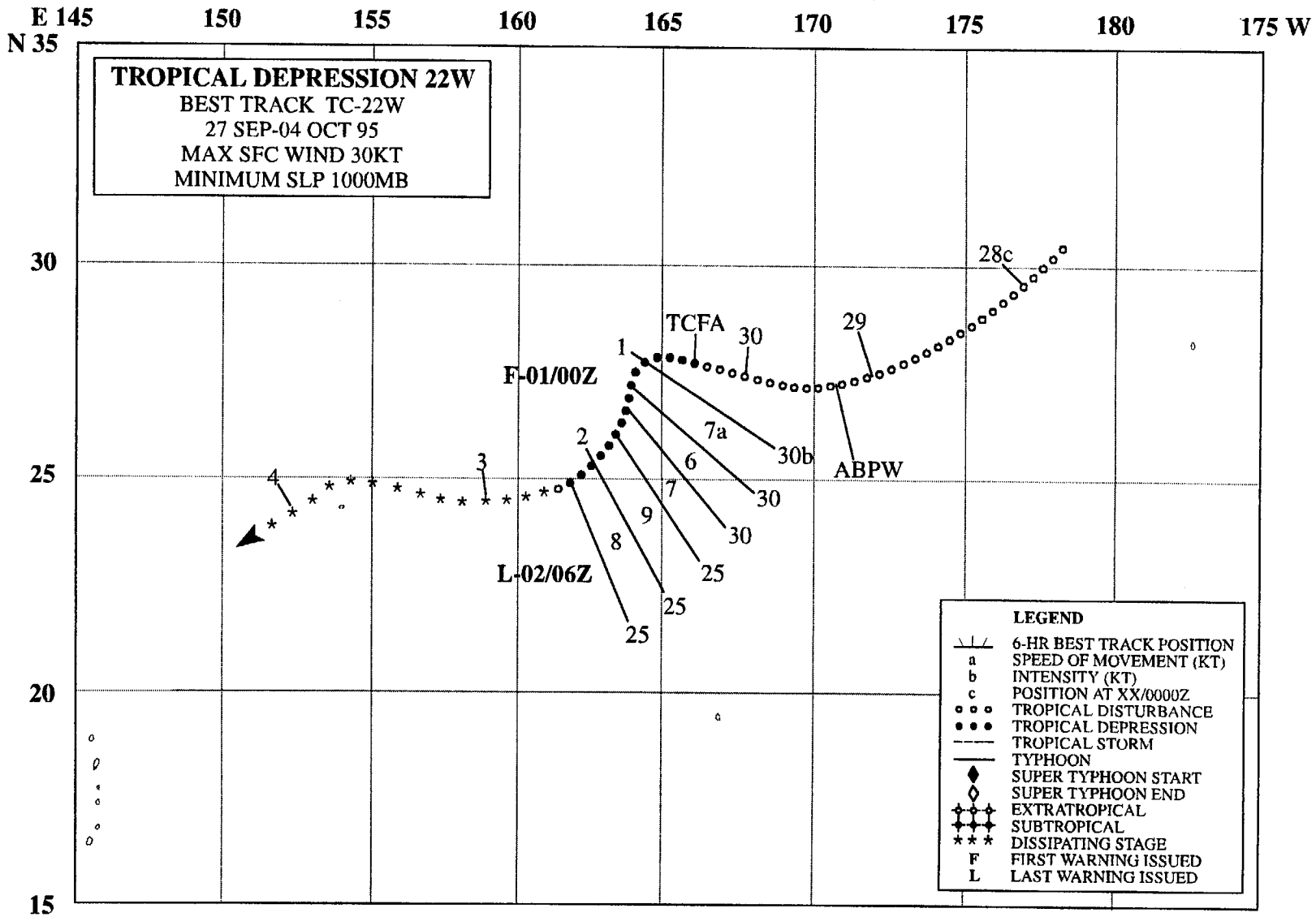
E 145
150
155
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165
170
175
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175 W
N 35
30
25
20
15
TROPICAL DEPRESSION 22W
BEST TRACK TC-22W
27 SEP-04 OCT 95
MAX SFC WIND 30KT
MINIMUM SLP 1000MB
F-01/00Z
L-02/06Z
TCFA
ABPW
28c
29
30
30b
7a
6
7
9
8
2
3
4
1
25
LEGEND
6-HR BEST TRACK POSITION
a SPEED OF MOVEMENT (KT)
b INTENSITY (KT)
c POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
SUBTROPICAL
DISSIPATING STAGE
F FIRST WARNING ISSUED
L LAST WARNING ISSUED

TROPICAL DEPRESSION (22W)

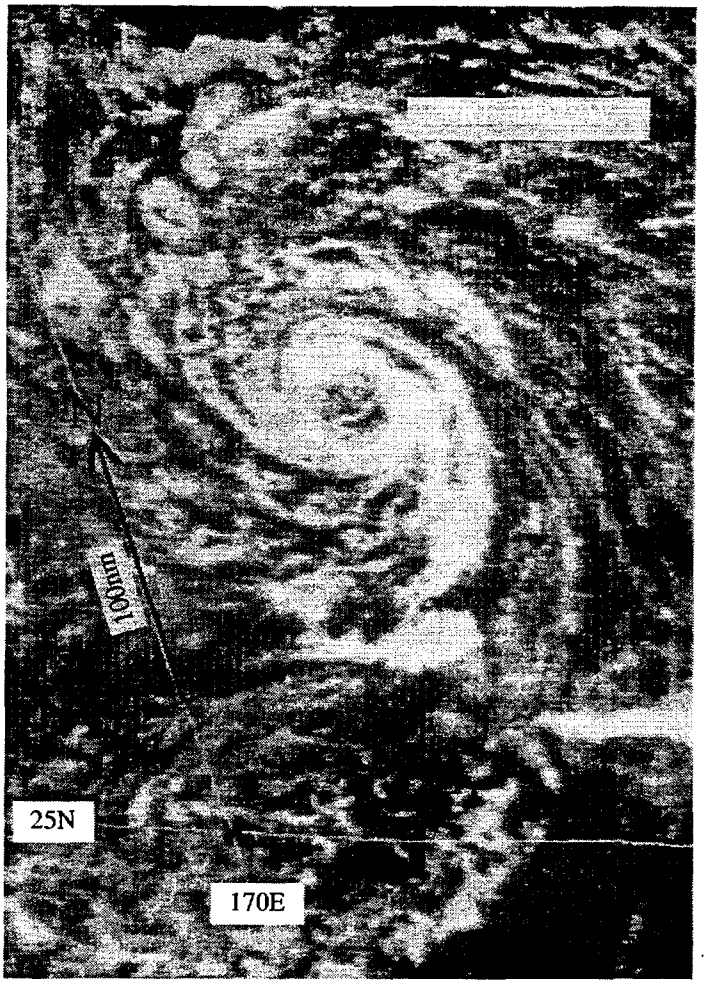

Figure 3-22-1 The low-level vortex that became TD 22W possesses cloud features that mimic those of a mature tropical cyclone: well-defined tightly coiled low-level cloud lines, and a "ring" of low and middle cloud surrounding a relatively cloud-free "eye" (290031Z September visible GMS imagery).

I. HIGHLIGHTS

Forming at a relatively high latitude (30°N) near the international date line, Tropical Depression 22W was a very small tropical cyclone — the smallest tropical cyclone in the western North Pacific warned on by the JTWC during 1995.

II. TRACK AND INTENSITY

On 24 September, a portion of a dissipating cold front (linked to an occluded low-pressure system south of the Aleutian Islands) pushed slowly southward across 30°N between 160° E and the international date line. An area of deep convection formed along this front near the international date line. This convection was most probably associated with an upper-tropospheric low that was in the process of becoming cut-off at approximately 35°N 175°E. On 28 September, a very small well-defined low-level cyclonic vortex formed to the northwest of this area of deep convection. On 29 September, the deep convection in the subtropics (25-30°N) near the international date line subsided, however the very small well-defined low-level vortex remained (Figure 3-22-1) and began to drift toward the west. This low-level vortex was first mentioned on the 290600Z Significant Tropical Weather Advisory. This advisory included the following remarks:

" . . . A low level circulation is indicated on visible satellite imagery [Figure 3-22-1] . . . Scatterometer data [Figure 3-22-2] indicate winds of 20 to 25 knots, however, almost no [deep] convection is associated with this system . . ."

For the next several days, this vortex drifted toward the west-southwest while embedded in the east-northeasterly flow south of the axis of the lower tropospheric subtropical ridge. During the night of 29 September, deep convection (on the scale of an individual large thunderstorm) developed near the low-level circulation center of this disturbance (Figure 3-22-3). This deep convection grew and decayed several times until the night of 30 September, when it became more extensive and persistent. Based upon this increase and persistence of deep convection, a Tropical Cyclone Formation Alert was issued at 301200Z. On the morning of 01 October, the amount and organization of the deep convection associat-

ed with this very small vortex increased (Figure 3-22-4), and the first warning, valid at 010000Z, on Tropical Depression 22W was issued. Central deep convection associated with TD 22W persisted for only about 24 hours. On 02 October, the deep convection began to shear away to the east (Figure 3-22-5), and by the afternoon of 02 October the deep convection was lost. As a result, the JTWC issued the final warning, valid at 020600Z on Tropical Depression 22W. Steadily weakening, the low-level vortex continued to track toward the west-southwest, and could be located in the low-cloud field through 04 October.

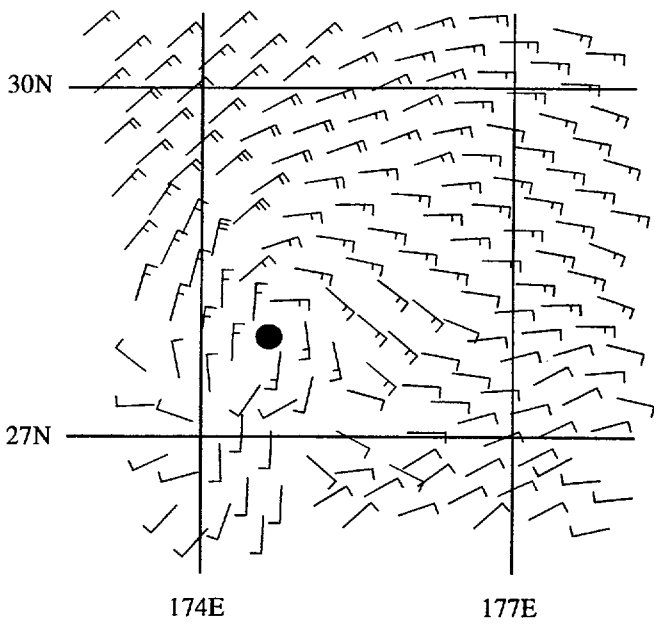

Figure 3-22-2 The surface wind field accompanying the low-level vortex (solid dot) that became TD 22W (281049Z September ERS-1 scatterometer-derived sur-

III. DISCUSSION

How small can a tropical cyclone be?

Tropical Depression 22W was a very small tropical cyclone — easily the smallest tropical cyclone of 1995, and perhaps about as small as a tropical cyclone can be. Although the processes governing the formation of the very small low-level circulation center that became TD 22W are uncertain, it is clear that this tiny vortex later acquired persistent central deep convection, and became a typical tropical cyclone except for its unusually small size. Before it acquired its central deep convection, the diameter of the region occupied by well-defined cyclonically curved lines of low-level clouds was approximately 180 nm (300 km). At one point, a ring of low and middle cloud (with perhaps some low-topped convection) (Figure 3-22-1) surrounded a relatively cloud-free "eye" whose diameter was 20 nm (35 km). Interestingly, the physical dimensions of these central features are typical for the analogous central features in much larger tropical cyclones. What seemed to contribute most to the apparent very small size of Tropical Depression 22W was the absence of peripheral bands of deep convection and extensive curved bands of outflow cirrus.

The very small size of Tropical Depression 22W leads one to ask a fundamental question: how small can a tropical cyclone be? The answer to this question is beyond the scope of this summary, however the nature of the formation and evolution of this tropical cyclone yield some information that may be relevant: (1) the size was established at the time of the genesis of its embryonic vortex, (2) the size was established before it acquired persistent central deep convection, and (3) the size remained unchanged during the brief 24-hour time span during which it possessed central deep convection. A final point to consider is that without remotely sensed imagery and scatterometry, it is doubtful that Tropical Depression 22W would ever have been detected.

IV. IMPACT

No reports of damage or injuries attributable to Tropical Depression 22W were received at the JTWC.

Figure 3-22-3 A lone thunderstorm casting a long shadow in the evening sunlight is the first deep convection to appear near the center of TD 22W (290531Z September visible GMS imagery).

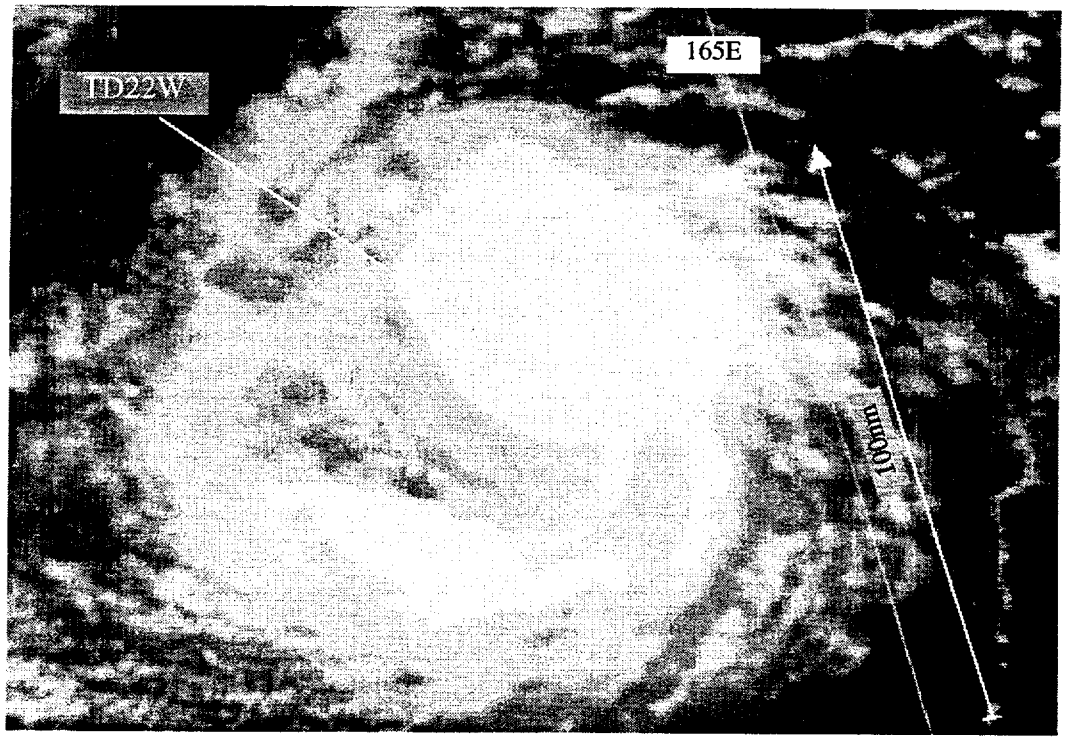

Figure 3-22-4 Deep convection associated with TD 22W reaches a maximum (010131Z October visible GMS imagery).

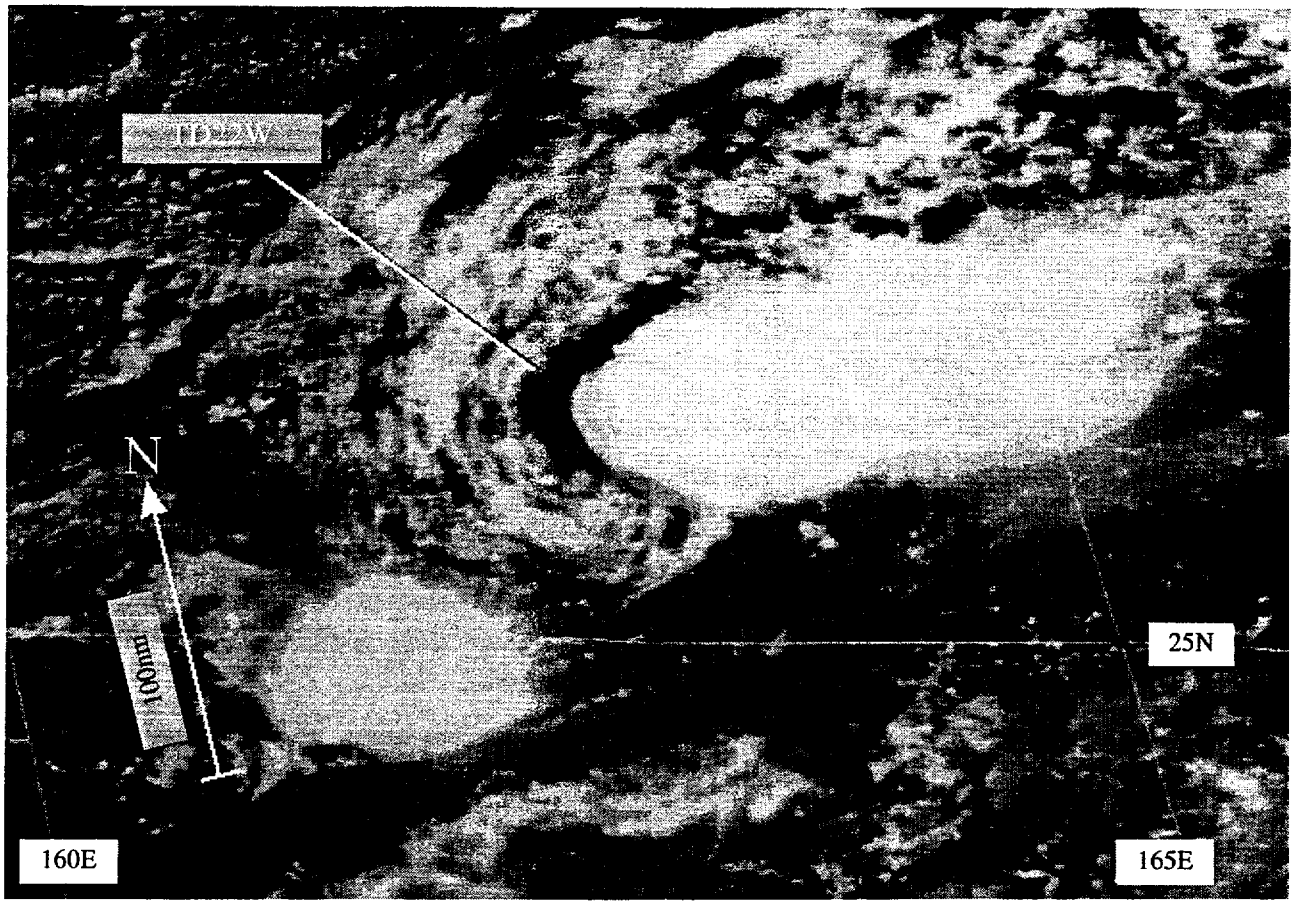

Figure 3-22-5 The central deep convection associated with TD 22W begins to encounter westerly vertical wind shear, and will shortly collapse (012131Z October visible GMS imagery).